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Research Article

Electroencephalography Aspects of Generalized Tonic-Clonic Seizures

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Abstract

Introduction: Epilepsy is one of the most common serious chronic neurological diseases, affecting people of all ages worldwide. It is present in several clinical forms, of which the EEG constitutes a preferred examination for diagnosing this disease. This paper focuses on studying the results of the EEG requested for epilepsy and/or generalized tonic-clonic seizure in order to establish the electro-clinical correlation.

Materials and Methods: This is a retrospective and descriptive study that took place over a period of one year from July 2018 to June 2019 at the neurology department, CHU Fann Dakar.

Results: Out of 3960 patients seen during the study period, 295 patients were retained after inclusion and exclusion criteria. The average age was 10.32 years. The male predominance is noted in our study population with a sex ratio of 1.78. In 44.74% of cases, our patients lived in urban areas. Among our patients, 15.25% of the patients presented EEG signs in favor of generalized tonic-clonic seizures on the waking EEG and 38.98% on the sleep EEG.

Conclusion: The request for the EEG requires a rigorous clinical description and must be performed as early as possible to improve sensitivity. In the case of epilepsy or generalized tonic-clonic seizure, the clinical and electrical correlation was around 15 to 39% in the interictal EEG examinations in 48 hours after the last seizure. Some patients may have a normal EEG, which does not rule out the diagnosis of epilepsy and/or generalized tonic-clonic seizures, hence the importance of good clinical analysis in epilepsy.

Keywords: Tonic-Clonic Seizure; Epilepsy; EEG

Introduction

Epilepsies are a set of syndromes and diseases characterized by a predisposition of the brain to present epileptic seizures and by the neurobiological consequences (cognitive, psychological and social) which result from it. An epileptic seizure is a paroxysmal neurological manifestation caused by the sudden and transient hypersynchronization and hyperactivation of a group of brain neurons. Epilepsy is one of the most common serious chronic neurological diseases, affecting people of all ages worldwide [1,2].

The manifestations are multiple ranging from focal seizures to generalized seizures and in some cases atypical or even unclassifiable seizures. Generalized tonic-clonic seizures (CTCG) represent the most spectacular clinical form of epileptic seizures, characterized by the occurrence of three consecutive phases and are responsible for an atmosphere of anxiety in the family and those around them. CTCGs are the most well-known clinical epileptic manifestations both by those around them and by medical practitioners [3].

Electroencephalography (EEG) is a neurophysiological exploration technique, allowing the collection of electrical activity of cerebral origin by means of electrodes placed on the scalp. It is an irreplaceable examination for the diagnosis and treatment of epilepsies [4].

We carried out this study in order to study the results of the interictal EEG requested within 48 hours of the last seizure for a generalized tonic-clonic convulsive seizure.

Methodology

This is a retrospective and descriptive study that took place over a period of one year from July 2018 to June 2019. This study targeted all patients seen for an EEG examination in the laboratory of exploration of the nervous system, neurology department CHUN Fann Dakar. All patients were included for a first electroencephalographic examination whose indication is a generalized tonic-clonic seizure or generalized tonic-clonic epilepsy. On the other hand, excluded patients had critical results including patients who had clinical or electrical seizures during the realization of the EEG examination, patients who had the last crisis more than 48 hours, and patients who did not did not perform the waking and sleeping EEG examination.

Results

During this study period, we registered 3960 patients for EEG examination. Among these patients, we collected 431 EEG requests for generalized tonic-clonic seizure or generalized tonic-clonic epilepsy. We withdrew 136 patients, including those who did not meet the inclusion and exclusion criteria. A total of 295 patients were included in this study, which represented 7.44% of patients seen for an electroencephalographic examination. The age of the patients was from 6 months to 76 years with an average age of 10.32 years and the majority less than 5 years. The male predominance is noted in 64% (n = 189) against 36% (n = 106) of female gender with sex ratio at 1.78. Patients lived in urban areas in 44.74% (n = 132)**.** The duration between the last attack and the performance of the EEG was 5 to 48 hours with an average of 15 hours. We found 15.25% (n = 45) of patients with confirmation of generalized tonic-clonic seizures on waking EEG and 38.98% (n = 115) on sleep EEG.

Discussion

The objective of this study is to determine the correlation between the indication and the results of the interictal EEG in generalized tonic-clonic seizures or generalized tonic-clonic epilepsies in the neurology department, Fann University Hospital Center, Dakar.

We collected 295 patients in this study, which represented 7.44% of patients seen for an electroencephalographic examination. CTCGs are the best known but not the most frequent. According to the literature, the frequency of CTCG compared to other types of seizures was estimated differently by the authors. The frequency is variable between 6.6 and 36.5% [5]. In sub-Saharan Africa, there is a predominance of generalized tonic-clonic seizures with an average of 59% in all seizures. Indeed, it therefore seems that acquired epilepsies constitute the vast majority of cases in children in sub-Saharan Africa [6,7]. Acute epileptic seizures are associated with infections in more than 80% of cases as carried out by the study of Idro., *et al*. of 900 acute seizures occurring in children aged 3 to 13, admitted to a district hospital over a period of 2 years, in Kenya [8]. Malaria was still the most encountered diagnosis (63%) in a recent study conducted in two sub-Saharan countries (Democratic Republic of Congo and Rwanda) by Kaputu., *et al*. on a population of 436 children aged 5 months to 10 years presenting with seizures [9-11].

Basically, generalized tonic-clonic epilepsy (ETCG) has multiple risk factors, various differential diagnoses and various etiologies, i.e., those that explain the variable frequency in some studies. The frequency and distribution of epileptic disease depends on a number of more or less well-identified risk factors.

The majority of our patients admitted for generalized tonic-clonic seizures are under 5 years old with an extreme of 6 months to 76 years old. The average age is 10.32 years. Epidemiological studies show a higher incidence of cases of epilepsy in children and more particularly in young children than in adults [3,9]. Between 0-10 years the incidence is 80-120/100,000 against 20-40/100,000 in adults [2]. It is a frequent disease whose prevalence in children worldwide is estimated between 4 and 5‰ [2,7].

In Bamako, according to a study carried out in a pediatric environment, the prevalence is 11.7‰ with an average age of 8.24 years [9]. Sub-Saharan Africa and Latin America have high overall prevalences with respectively 15‰ and 17.8 ‰ compared to the prevalences observed in Europe (5.4‰) and North America (5 to 10‰) [2]. In general, the distribution of the disease shows a bimodal distribution with very high rates at both extremes of life.

We note a male predominance in our study population (male = 189 and female 106) with a sex ratio of 1.78. Data from the literature show that there is a male predominance for epilepsy with CTCG. This is with the sex ratio varying between 0.69 and 1.25. All

surveys, with rare exceptions, show a higher frequency in the male sex [3,6,8].

The majority of our patients (44.74%) lived in urban areas. Several African studies share the same results. In Mali, the prevalence of epilepsy is 15.6‰ in rural areas, and 14.6‰ in urban areas based on the general population [10]. The predominance of the patients resides in the urban environment in our study, and it is the reflection of the distribution of the global population following rural exoduses in our country. In addition, the place of recruitment of this study is in urban environment. The predominance of patients from urban areas could be explained by the proximity of his residence and the place of study as well as the accessibility of patients. On the other hand, according to WHO data, epilepsy is more common in rural areas. Worldwide, more than 50 million people suffer from epilepsy, which is more than three-quarters of those who live in low- and middle-income countries [12]. Other studies in Mauritania point out that the prevalence of epilepsy in developing countries (DCs), and more particularly in Africa, is around 2 to 5 times that of industrialized countries [13].

The electroencephalogram is a simply feasible dynamic examination that explores brain function. The major indication is epilepsy. The interictal EEG, sensitized if necessary by sleep deprivation, provides arguments for the positive diagnosis of an epileptic seizure, suspected clinically. It is used to classify seizures and epilepsies. The EEG in children has particularities, whether for its realization or for its indications. Video-EEG is a first-rate diagnostic tool, fortunately more and more widespread [14].

CTCGs can occur as isolated or dominant manifestations of several forms of primary generalized epilepsy in children, the best individualized of which is epilepsy with tonic-clonic seizures on awakening in adolescents. These seizures may also represent the rapid generalization of a particularly brief partial seizure that may go unnoticed. In this study, we can say as in the literature that the sleep EEG is more sensitive compared to the waking EEG. Indeed, several explanations are put forward such as, during sleep, the number of artifacts or extra-cerebral stimulation is reduced. Also, sleep promotes physical rest which could facilitate recording and EEG traces become clearer. On the other hand, during the EEG the day before, the recording could be disruptive by voluntary movements, extra-cerebral stimuli, and various recording artifacts [15,16].

The waking EEG includes stimulation tests (PNH, SLI) adapted to the child's age and degree of cooperation. PNH can be performed from the age of 4, unless there are contraindications (Moya disease Moya, drepanocytosis, etc.), which could explain the fairly similar sensitivity of the waking and sleeping EEG [4].

In our study, the concordance of the results in the interictal waking EEG is 15% (n = 45), and the EEG examination was normal in 35% (n = 103). This could be explained either by the incoherent description of the clinicians during the clinical analysis before asking the indication of the EEG, or by the realization of the EEG outside the convulsive seizure (interictals) [15]. In Cameroon, a study by Nguefack S. found the abnormal EEG during epilepsy in 193 out of 500 tracings analyzed (i.e., 38%) in waking EEG without taking into account the clinical correlation, which suggests the possibility of the Normal EEG even with correct indication. Likewise, Kürsad in 2003 in Turkey had found 36.2% of abnormal tracings in a series of 534 epileptic patients, which is substantially identical to our results [14,17].

The demand for the EEG requires a rigorous clinical description in order to pose the electroclinical correlation. This situation is often seen during a secondarily generalized focal seizure; the clinical manifestations at the start of the generalization could be subtle and go unnoticed by the family and/or clinicians [15].

The results of the EEG examination are influenced by the time between the last attack and the EEG examination. It is obvious that the earlier the examination, the higher the sensitivity.

All in all, the waking EEG unfortunately has some drawbacks. On the one hand, the technical quality of acquisition can be very poor without anyone realizing it and the number of electrodes reduced, which does not make it possible to properly locate focal anomalies. On the other hand, electroclinical correlations are not always easy since they are based on the description by the patient and the entourage of the paroxysmal episodes [17].

In our study, the correlation of sleep EEG was 38.98% in favor of generalized tonic-clonic seizures and only 24% of EEGs are normal. The correlation of the sleep EEG is more efficient. Several literatures confirm that all these activations such as nap or nighttime sleep recordings and daytime recordings after sleep deprivation are likely to promote the occurrence of interictal abnormalities or focal or generalized epileptic seizures [18].

Conclusion

Even if the diagnosis of epilepsy is above all clinical, the EEG remains an essential tool in the management of epileptic patients. Indeed, it is the first complementary investigation to be requested in patients presenting critical phenomena. We have seen that EEG results are influenced by the time between the last seizure and the EEG examination. It is obvious that the earlier the examination, the higher the sensitivity. The recording requires a particular condition for the quality of the results because artefacts frequently complicate the interpretation of the EEG, which is why the sleep tracing is systematically essential as soon as possible. The diagnosis of generalized tonic-clonic epilepsy was essentially made clinically and the use of waking and sleeping EEG is necessary for confirmation, or in case of doubt diagnosis and monitoring of treatment. The specificity and the sensitivity of the EEG are attached to the precise description of the epileptiform anomalies observed according to the clinical context of realization even if the results are normal.

Conflict of Interest

No conflict of interest.

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